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THE CHRONICLE of Higher Education.

ISSN 0896-7482

June 7, 1989 • $2
Volume XXXV, Number 39

News Summary

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Cornell has devised a way to step up the development and marketing of its research discoveries: Page A29.

As the cost of health insurance continues to soar, many students are choosing to go without it: Page A31.

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Mikhail Gorbachev said that education, science, and culture were still among his top priorities in his struggle for *perestroika:* Page A35.

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Student-Loan Rules Will Penalize Colleges With Many Defaults

But they are easier on institutions than Bennett's proposals last year

By ROBIN WILSON
WASHINGTON

Education Secretary Lauro F. Cavazos last week released rules setting up penalties for colleges and trade schools where large numbers of former students have defaulted on Stafford Student Loans.

The rules, which will be much easier on institutions than those proposed last year by then–Education Secretary William J. Bennett, were applauded by members of Congress and college representatives here.

"This is a very positive, constructive approach that allows a great deal more flexibility" than Mr. Bennett's plan, said Charles B. Saunders, Jr., senior vice-president of the American Council on Education.

Rep. Pat Williams, the Montana Democrat who heads the House Postsecondary Education Subcommittee, also praised the rules. "The Secretary has suggested a measured and thoughtful package of default regulations and proposals," he said. "They are not punitive, as were Secretary Bennett's proposed solutions."

Officials of historically black colleges, however, said they thought the rules would hurt their institutions and make it more difficult for some black students to get a college education.

The release of the regulations, some of which will take effect as early as next

Continued on Page A16

Many Colleges Reporting Full Freshman Classes, but Fewer Applicants

By THOMAS H. MOORE

Unexpectedly volatile circumstances have made this admissions season complex for many college admissions officers. But, for the most part, their nightmares of half-filled freshman classes and institutions' shutting their doors have yet to come true.

While applications dropped at many colleges and universities, most admissions people remain optimistic about the size and quality of next fall's freshman classes.

Frank Burtnett, executive director of the National Association of College Admissions Counselors, said he believed that, nationally, students filed fewer applications. "It's the same kids engaged in a little more discrimination. Some kids have seen that sending in 15 applications hasn't paid off for the kids that are in college now.

"We're still trying to get the pulse of the impact of declining numbers of 18-year-olds," he added. "I'm not sure we fully understand what impact that will have."

Katherine H. Hanson, executive direc-

Continued on Page A31

MISCONDUCT IN SCIENCE

Congress's Interest in Ferreting Out Fraud Is Misinformed, Harmful, Say Researchers

By SCOTT JASCHIK
WASHINGTON

Researchers and administrators at research universities are increasingly worried about Congress's interest in scientific misconduct.

Most of the officials say that fraud by researchers is rare and that lawmakers have been misinformed about its extent. But even as they offer those defenses, they say that continuing Congressional hearings and the widespread publicity they have attracted have seriously damaged the political influence of academic research.

If that damage is not repaired, they add, researchers may face increased regulation of federally supported work, a loss of support for federal financing of research, and attempts by Congress to determine the validity of scientific findings.

"The degree of interest in Congress overwhelmed many of us," says David Korn, dean of the School of Medicine at Stanford University. "We simply did not realize the interest in issues we thought were infrequent events."

Albert A. Barber, vice-chancellor for research at the University of California at Los Angeles, says: "Now, no one can ignore the seriousness with which this issue is facing us."

A Congressional aide says: "The reports of misconduct haven't damaged

Continued on Page A25

'GODDESS OF DEMOCRACY' IN BEIJING

Pro-democracy students created the 'Goddess of Democracy,' a sculpture modeled after the Statue of Liberty, in Tiananmen Square last week. Page A35.

MARGINALIA

Driving to work one day last week, we heard a local news announcer cite a story in the "Seattle *Post-Intelligentsia*."

■

This Month, a calendar of coming events at Portland State University, carries the following listing for June 27:

"SLIDE LECTURE: Carl Sagan on 'The Origins of Life in the University & the Search for Extraterrestrial Intelligence.' "

The second is easy to explain; the first, a lot more difficult.

■

From an article in *Adult and Continuing Education Today*:

"Some folks celebrate the end of winter by reading seed catalogs. I read the Iowa Valley Continuing Education catalog to get a feeling of what life is like in the midwest I fled so many years ago. . . .

"My father, whose name I bear, left the little town where he and I were born at the turn of the century."

Twins?

■

Item in a bulletin from the Texas Council of Women School Executives:

"The nomination process is under way for the 1989 Summer Conference Awards. . . .

"Nominations will be accepted until 15, 1989."

Hurry!

■

Job listing in *Panorama*, a career-opportunities bulletin from York College of Pennsylvania:

"MARCHING BANK DIRECTOR / TEACHER–High school, some choral experience helpful."

Something to do with the savings-and-loan crisis, probably.

■

From a "Statement on Plagiarism," published in *Perspectives*, the newsletter of the American Historical Association:

". . . By these measures we declare our commitment to accuracy, responsible judgement, and probity and thereby affirm our disavowal of shoddy endeavors whether born of haste, inadequate research, faculty calculations, or misrepresentation."

Bully!

■

International note (a headline in the Emory University *Wheel*):

STUDENTS RETURN TO POLES
TOMORROW TO ELECT SGA EXECS

■

It has come to this:

A letter from the North Dakota Prevention Resource Center identifies its writer as a "School Prevention Specialist." —C.G.

In Brief

Cal. Ruling Overturned in Agriculture Case

A state appellate court has reversed a lower court's decision requiring the University of California to revise its agricultural research program to provide greater benefits to small farmers, farm workers, and consumers.

In a unanimous ruling, the three-member state Court of Appeal said there was nothing in federal law that would require the university to refocus its research projects to support small-farm enterprises. The 10-year-old case has been closely watched by agricultural and higher-education interests.

Two years ago, Superior Court Judge Raymond L. Marsh ruled that an 1887 federal statute required land-grant institutions to give small farmers "primary consideration" in federally financed research.

The university said Judge Marsh's ruling would have interfered with academic freedom.

California Rural Legal Assistance, the public-interest group that filed the original lawsuit, said it would probably appeal the ruling.

U. of Michigan Is Sued Over Anti-Bias Policy

The American Civil Liberties Union of Michigan has sued the University of Michigan charging that the institution's new anti-discrimination policy is unconstitutional.

The policy, which took effect last fall, sets penalties for students found guilty of committing discriminatory acts, including verbal harassment.

The A.C.L.U. sued on behalf of a graduate student at the university who is studying biopsychology. The student contends that the policy interferes with his First Amendment rights to speak about his research, which has involved the influence of sex, race, and other factors on mental performance.

"The fact is our plaintiff and others say they are afraid to say things in classes and in dormitories," said Paul Denenfeld, legal director of the A.C.L.U. of Michigan. "They do not know what this policy prohibits and what it doesn't."

Walter Harrison, a spokesman for the university, said the policy struck a careful balance between the First Amendment and Michigan's intention to oppose discriminatory acts.

So far, more than 100 complaints have been filed under the policy, most of them regarding sexual harassment, he said.

University Apologizes to American Indians

The administration of the California State University at Chico has issued a formal apology to a group of American Indian students who said they had been taunted with "war whoops" and racial slurs during a campus event in April.

The university said it could not determine with certainty who committed the acts. The students had accused members of the university's baseball team and its coach, Dale Metcalf. The students said Mr. Metcalf had apologized.

The incidents occurred in a physical-education building as the students were preparing to stage dances as part of the 11th Annual American Indian Days Pow Wow, a celebration of American Indian heritage held on the university's campus.

Robin Wilson, president of the university, also asked the Faculty Senate to develop plans to combat acts of racism on the campus.

U. of Cal. Forms Center on School Reform

The University of California has announced the establishment of the Educational Leadership Institute at its Santa Barbara campus to promote the collaboration of faculty members and school superintendents in the reform of elementary and secondary schools.

The institute, which was developed by the Graduate School of Education on the Santa Barbara campus, will conduct seminars on educational reform and organize projects to improve schools.

The university plans to provide about $295,000 to operate the institute for the first year.

Student Sues Colgate U., Others for $5-Million

A Colgate University student who was allegedly gang-raped at a fraternity party in 1987 has sued the institution, charging that it failed to provide a safe environment on the campus.

The lawsuit seeks $5-million in compensatory damages and an unspecified amount in punitive damages from the university and three other parties—the local chapter of Sigma Chi fraternity, in whose house the rape is alleged to have occurred; the national Sigma Chi organization; and the beer distributor that allegedly sold alcohol to fraternity members for the party, said John C. Setright, a lawyer representing the victim.

As the fraternity's landlord, Colgate is accused in the lawsuit of failing to control the party and prevent under-age drinking. The lawsuit said the fraternity and the

Study Sees Enrollment Rise in Engineering Courses

WASHINGTON

The number of college freshmen enrolled in engineering programs last fall increased for the first time since 1982, according to a study by the Engineering Manpower Commission. Much of the increase was due to the numbers of female and minority students entering the field, the panel noted.

The results of the survey—released last week by the National Action Council for Minorities in Engineering at its annual meeting here—show that overall freshman enrollment in engineering programs last fall increased by 2.7 per cent from 1987.

The number of black students enrolled in engineering programs increased by 15 per cent, to 7,075. Hispanic enrollment increased 11 per cent, to 4,246. The number of women enrolled rose by 5.6 per cent, to 15,837.

Demographics Cited

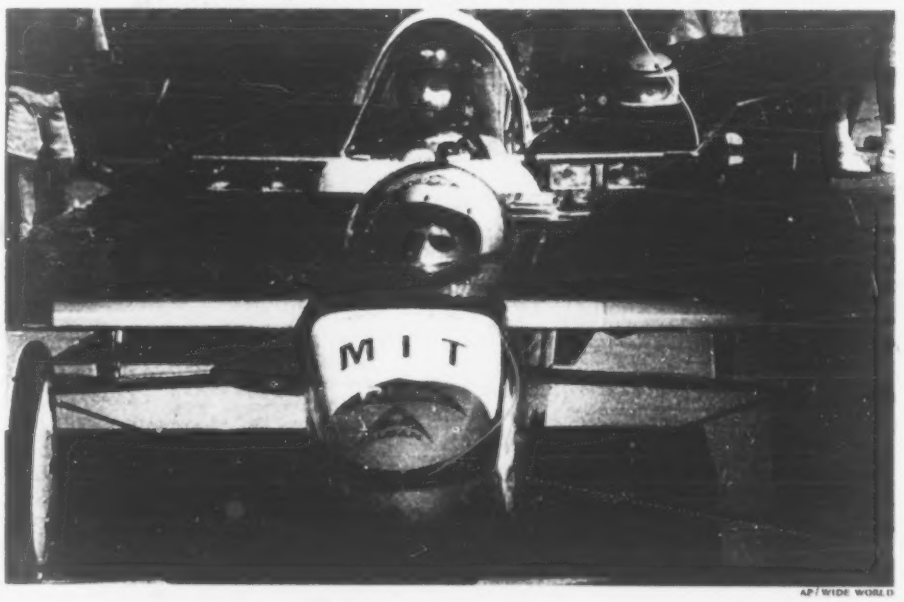
Officials of the commission, which is supported by the action council to monitor minority participation in engineering, called the increases significant. But they stressed that demographics had had a big impact on the results.

The increases correlate with a modest rise in the number of births 18 years ago, officials noted. Thereafter, birthrates dropped. Hence, the officials said, they predict a decline in engineering students within the next few years.

Officials also credited the efforts of groups like the council with helping to boost minority enrollment in engineering.

—COURTNEY LEATHERMAN

GENTLEMEN, START YOUR PHOTOVOLTAIC CELLS!



AP/WIDE WORLD

CONCORD, N.H.

James D. Worden (*above*) and four other college students and professors spent four days soaking up rays in the first American Tour de Sol solar-car race.

Mr. Worden, a student at the Massachusetts Institute of Technology, won the 208-mile road race in slightly more than six hours. Driving his university's entry—"Solectria 5"—Mr. Worden defeated teams from New Hampshire Technical and Worcester Polytechnic Institutes and Dartmouth College.

The race—sponsored by a nonprofit, advocacy group called the Northeast Solar Energy Association—started in Montpelier, Vt., and ended on the M.I.T. campus in Cambridge, Mass. The cars, equipped with panels of photovoltaic cells that convert the sun's rays into electricity, were displayed at local colleges after each leg of the race. Two of the participants drove commuter-style solar cars, which accommodate two passengers. —C.G.L.

The Chronicle of Higher Education (ISSN 0009-5982) is published weekly except the last two weeks in August and the last two weeks in December, at 1255 Twenty-Third Street, N.W., Washington, D.C. 20037. Subscription rate: $55 per year. Second-class postage paid at Washington, D.C., and at additional mailing offices. Copyright © 1989 by The Chronicle of Higher Education, Inc. Printed in the United States of America. POSTMASTER: Send address changes to The Chronicle of Higher Education, P.O. Box 1955, Marion, Ohio 43305. Member, Audit Bureau of Circulations. The Chronicle reserves the right not to accept an advertiser's order. Only publication of an advertisement shall constitute final acceptance of the advertiser's order.

Foot-notes

The American Association for the Advancement of Science would like people to start thinking science, not cookies, when it comes to Girl Scout activities.

Starting in the fall the association will train Scout leaders in science, mathematics, and computer technology. It hopes the leaders will become more familiar with technical fields and more confident about incorporating science activities into their troops' schedules.

Only recently has the organization added merit badges for activities in science-related areas, such as "science sleuth," "computer fun," "math whiz," and ecology. The additions came in response to the changing role of women in the workplace and to the recognition that girls do not have enough social reinforcement to pursue scientific activities as they start to think about careers.

Because many troop leaders themselves had little exposure to science and technology in school, they did not encourage their Scouts to perform the tasks necessary to acquire badges.

The project, which will begin in Minnesota, North Dakota, and South Dakota, is part of the association's existing program to increase participation in science among women, members of minority groups, and the disabled.

■

The Hubble Space Telescope, whose launch has been delayed since the explosion of the space shuttle *Challenger* more than three years ago, has been delayed again.

The National Aeronautics and Space Administration, which last year postponed the launch of the telescope from June 1989 to December, has postponed it again to the spring of 1990 to make way for military missions of the shuttle.

The delay has not only frustrated the space-science community, but added substantially to the cost of the $1.1-billion space telescope. NASA officials estimate that maintaining the telescope in a dust-free environment on earth is costing the agency $6-million a month.

■

Violence by some animal activists has become a costly problem for research laboratories.

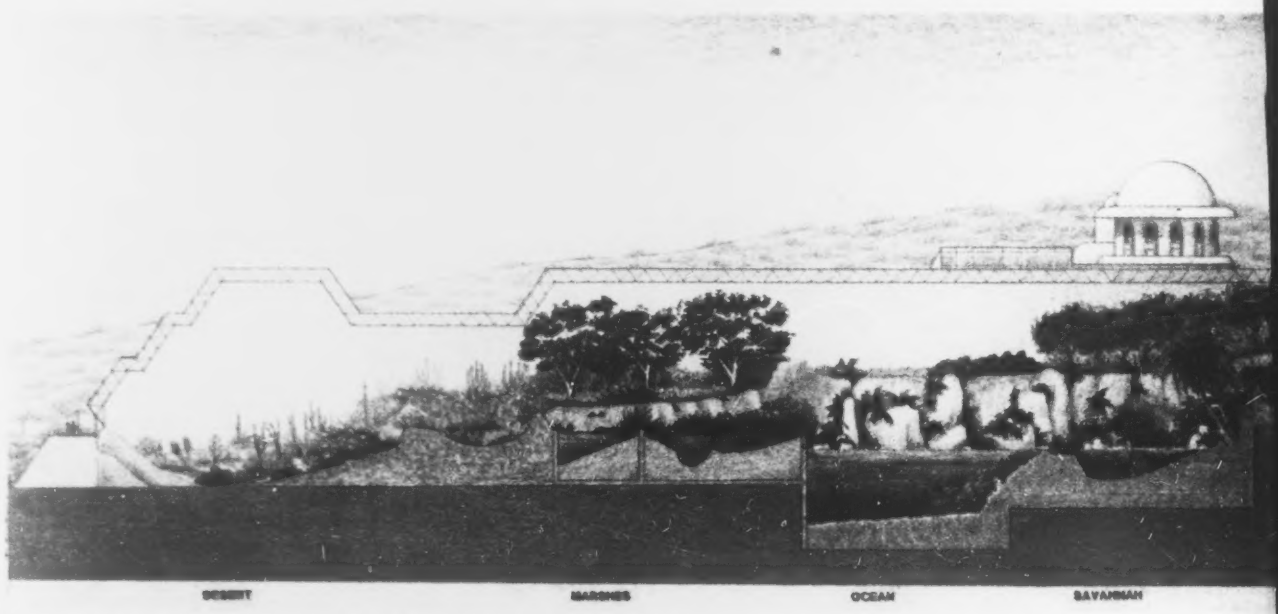
In the past seven years, 29 laboratories in the United States have suffered a total of $7-million in damage, according to an article in the current issue of the *Journal of the National Cancer Institute*, which obtained the figure from the Foundation for Biomedical Research.

The author of the article, Larry Horton, associate vice-president for public affairs at Stanford University, writes that scientists need to get personally involved "in the rough-and-tumble world of public debate and politics" if they want to win the battle over the use of animals in research.

Scholarship

Experiment in Arizona Desert Seeks to Help Scientists Understand Ecosystems, Prepare for Space Colonies

8 people will live for 2 years in a closed environment among 3,800 species of plants and animals



Biosphere II will offer different types of environments, including a tropical rain forest and a patch of ocean, inside its two-and-a-half-acre structure.

By DAVID L. WHEELER

TUCSON, ARIZ.

Science-fiction writers and scientists alike have wondered for decades how settlers on another planet could set up a self-sustaining, earth-like environment.

In an area about 20 miles north of here, where grassland meets cacti-studded desert in view of the Santa Catalina Mountains, some researchers in a two-and-a-half-acre structure resembling a giant terrarium may soon take the first realistic stab at answering that question.

The building, which is now under construction, will enclose a miniature tropical rain forest, a patch of ocean with a wave machine, pieces of savannah, scrub, desert, marsh, and coral reef. It will also contain a 50-foot-high mountain, a farm with fish, African pygmy goats, some Vietnam pot-bellied pigs, and chicken-like creatures called jungle fowl.

The building is scheduled to be completed and stocked with 3,800 species of plants, insects, and animals by September 1990—when eight people will enter the complex to live in the enclosed environment for two years. The participants will be able to contact friends and scientific colleagues by telephone and computer, but will leave only in the event of medical or personal emergencies, such as the death of a relative.

The structure has been named Biosphere II, since the project's creators believe Earth deserves the title Biosphere I. The future inhabitants of Biosphere II, in the New Age nomenclature of the project, have been dubbed Biospherians.

Working out of four stories of living and office space in the complex, the Biospherians will have to raise their own food, study how the flora and fauna interact in the "wilderness," and monitor the water and air inside the sealed environment to make sure they do not poison themselves.

Thirteen volunteers with research and applied-science backgrounds are in training for the eight slots as Biospherians. If five of the candidates do not drop out by the closing date, the final decision about who goes through the Biosphere's airlock next year will be made by the project director.

Backing for 'Biological Spin-Offs'

The Biosphere is being shaped by a group of scientists and architects who are under contract to Space Biospheres Ventures, a company supported by venture capital. The project's financial supporters, the most prominent of whom is Edward Bass, a wealthy Texan, are sinking more than $30-million into the complex in the hope that over its expected 100-year life span they will be able to recoup their investment by selling technology suitable for space colonies and for "biological spin-offs" that are useful on earth as well as in space, such as water- and air-recycling systems.

Scientists working on the project say the knowledge they will gain about how life operates on earth may be as valuable as the knowledge that could be applied to future space missions.

"When people begin to understand Biosphere II they will begin to understand their relationship to Biosphere I," says Carl Hodges, head of the Environmental Research Laboratory at the University of Arizona and one of the chief scientific consultants for the project.

The Environmental Research Laboratory is a collection of greenhouses, fish and shrimp hatcheries, and model homes

Academy Panel Recommends Significant Increases in Support for Magnetic-Fusion Energy Research

By KIM A. McDONALD

WASHINGTON

A panel of the National Research Council has recommended that the federal government increase its financial support for magnetic-fusion energy research by 20 per cent over the next five years to prevent further delays in the development of the potentially valuable new technology.

In a 149-page report, "Pacing the U.S. Magnetic Fusion Program," the panel advocated reversing the trend, begun in the late 1970's, of steadily declining federal support for magnetic-confinement fusion—an effort to generate nuclear-fusion energy by confining hot, electrically charged hydrogen gas within powerful magnets.

Unlike recent efforts to generate energy from room-temperature nuclear fusion, which most researchers now believe is scientifically impossible, conventional methods of fusing atoms require scientists to simulate the conditions found in the sun and stars.

The technical difficulties involved in that feat required billions of dollars from the federal government over the past 30 years and frustrated many members of Congress, who have questioned continued support for fusion research and sought to narrow the focus of magnetic-fusion energy programs.

The panel of the research council, the research arm of the National Academy of Sciences, noted in its report that the steady erosion of federal support—which is now 50 per cent less than the fiscal 1977 level after inflation—had resulted in the coun-

Continued on Page A6

Panel Recommends Large Increases for Magnetic-Fusion Energy Research

Continued from Page A4

try's losing leadership in the field to Europe.

The panel added that the present level of research support was also unrealistic if the Department of Energy is to meet its goal of establishing, by 2010, a scientific and technical base for the construction of a commercial fusion-energy reactor.

Magnetic-Fusion Research Funds
(In thousands)

	Fiscal 1988
Princeton Plasma Physics Lab	$85,858
Lawrence Livermore National Lab	42,401
Oak Ridge National Lab	37,643
General Atomics	30,970
Los Alamos National Lab	19,081
Mass. Inst. of Technology	14,929
U. of Cal. Los Angeles	5,490
U. of Texas	5,463
Argonne National Lab	4,305
Sandia National Labs	4,122
Spectra Tech	4,010
U. of Wisconsin	3,692
Pacific Northwest Lab	2,790

SOURCE: U.S. DEPARTMENT OF ENERGY

Further Increases

To maintain that schedule, it added, Congress must not only increase the department's budget for magnetic-fusion energy by 20 per cent above its fiscal 1988 level of $335-million over the next five years, but provide an additional increase of 25 per cent over the latter half of the 90's.

The panel said such a financial commitment would assure the completion and operation of the Compact Ignition Tokamak, a $400-million fusion device that President Bush has asked Congress to begin building next fall at the Princeton Plasma Physics Laboratory. It would also allow the United States to participate in the international construction of a large-scale, test fusion reactor.

In his fiscal 1989 budget request, Mr. Bush asked Congress for $349.5-million for magnetic-fusion research. While the House and the Senate Appropriations Committees have not yet begun work on their energy-appropriations bills for 1989, the House Subcommittee on Energy Research and Development of the Science, Space, and Technology Committee, which authorizes energy-research appropriations, has approved a level $25-million above that which Mr. Bush's requested.

A staff member for the subcommittee said the increase was specifically designed to accelerate construction of the Compact Ignition Tokamak, a device that would seek to achieve a self-sustaining fusion reaction.

Because future, large-scale experiments are likely to require much larger financial commitments, the research-council panel recommended in its report that "the United States enter into partnership arrangements for the next major steps in an international fusion program," specifically, the engineering test reactor under consideration by a number of countries for construction in the mid- to late-1990's. It also recommended that the Energy Department revise its program to encourage greater participation by American companies.

The panel, which was chaired by Irvin L. White, president of the New York State Energy Research and Development Authority, completed its report before it could consider the implications of reports of room-temperature nuclear fusion—reports that most fusion researchers now believe to be erroneous.

The Energy Research Advisory Board, which provides advice to the Energy Department on its research programs, has created a 22-member panel charged with looking at the status and promise of room-temperature fusion. The committee, which was formed in response to a request from Energy Secretary James D. Watkins, is headed by Norman F. Ramsey, an emeritus professor of physics at Harvard University, and John R. Huizenga, professor of chemistry and physics at the University of Rochester.

That panel is scheduled to deliver a preliminary report on the status of the experimental and theoretical results by July 31. Mr. Huizenga said that if the panel believes room-temperature fusion research merits support, it will issue a final report by November 15 identifying the types of research that need to be pursued.

'Biosphere' Aims to Help Scientists Understand Ecosystems

Continued from Preceding Page

nated with a Soviet scientist, Vladimir Vernadsky, in a 1926 book.

It was extended further by James Lovelock in a 1979 book, *Gaia: A New Look at Life on Earth*, in which Mr. Lovelock postulated that "the Earth's living matter, air, oceans, and land surface form a complex system which can be seen as a single organism and which has the capacity to keep our planet a fit place for life."

Soviet scientists who have tried constructing contained ecosystems in Siberia limited to a few species visited Tucson last month, and described to the Biosphere researchers their attempts at putting humans in sealed systems for up to five months—a period of time long enough to reach Mars.

Although many people have tried to build terrariums for pleasure, few scientists have tried sealing them up and studying them. The late Clair Folsome, a professor of microbiology at the University of Hawaii, demonstrated that glass spheres filled with sand, algae, shrimp, and water could maintain life for decades. In preparation for Biosphere II, Robert Frye, a scientist with the University of Arizona's Environmental Research Laboratory, has been experimenting with small collections of plants and soil in aquariums and five-gallon jugs.

Test Runs in 5-Gallon Jugs

"One of my first questions was, Could I force a system into failure?" said Mr. Frye. "Indeed I could, but it took a lot of work."

From his experiments in the small containers, Mr. Frye was able to predict, with a high degree of accuracy, the proportions of carbon dioxide and oxygen in the air of a 15,000-cubic-foot test module at the Biosphere site. Maintaining the balance between oxygen created by plants and carbon dioxide exhaled by humans will be vital in the Biosphere.

The air will be contained in the Biosphere by sheets of glass held in place with steel frames and a rubbery sealant. Huge external bellows will allow air inside the Biosphere to expand and contract with the temperature extremes of the desert without bursting the glass sky. Computer-operated louvers will provide shade for plants and temperature control.

The scientists working on the Biosphere say similar structures could serve as laboratories where they could test the effect of environmental disturbances such as acid rain or ozone depletion. The Biosphere itself will help determine the impact of the greenhouse effect, since conditions inside the complex will be similar to those many environmental scientists are predicting for the year 2030, with temperatures ranging from 2 to 8 degrees Fahrenheit above today's average temperatures.

> "We could employ five times as many people as we have and not answer all the questions we'd like to."

The Biosphere will also help environmental scientists devise new technologies for cleaning up pollutants. In the Biosphere's "atmosphere," even ethylene, a hydrocarbon given off by tomatoes, could build up to toxic concentrations, so the air will be filtered through soil filled with microbes able to convert the ethylene into more benign gases. The air and water in the Biosphere will be continuously monitored by computer, but that monitoring will be augmented with samples taken manually and checked individually.

To keep tabs on the participants' health, frequent physical examinations will be performed, probably by one of the candidate Biospherians who is a physician. The Biospherians will also be able to consult with physicians at the University of Arizona's medical school, where their medical records will be kept. Although routine medical care can be provided in the Biosphere, an emergency requiring surgery would mean a trip outside.

Keeping the Balance

The scientists at the Environmental Research Laboratory believe they can keep the major gases and soil nutrients in the right balance in the Biosphere. But they worry that elements or minerals that are necessary only in small quantities might, in some unforeseen way, get locked up somewhere so they would not be available for all the organisms that need them.

That puzzle, and many others, cannot be solved before the start of the experiment.

"Realistically we could employ five times as many people as we have and not answer all the questions we'd like to by the time we have to close the doors," says Mr. Frye.

Others working on the experiment say that they cannot avoid ignorance, but they must avoid arrogance.

"There's not an ecologist in the world who can take a cubic meter of soil and know all of the biological interactions going on inside it," says Kathleen Dyhr, a manager of information systems for the Biosphere and a candidate Biospherian. "But we won't perish from our ignorance. We just can't be contemptuous and pretend we are not ignorant."

RESEARCH NOTES

Continued from Preceding Page

Each student rendered a verdict and then evaluated the memory and attention skills of eyewitnesses and the quality of details they provided.

Brad E. Bell, a graduate student, and Elizabeth F. Loftus, a professor of psychology, manipulated the degree of detail contained in the testimony of eyewitnesses for the defense and prosecution. For example, witnesses either noted the presence of several grocery items or listed each one by a specific name.

The researchers also varied the presence of details that were related or unrelated to the actions of the culprit.

In some instances, for example, witnesses recalled either items another customer had dropped before the shooting, or items the defendant carried as he fled the store.

Two related experiments demonstrated that when eyewitness testimony conflicted, the testimony that provided the most detail—even if it was irrelevant to the actual crime—carried more weight in a juror's decision.

The power of what the researchers call "trivial persuasion" was even more pronounced if one of the witnesses could not provide similar detail on direct questioning.

A report of the study appears in the May issue of the *Journal of Personality and Social Psychology*.

—CHRIS RAYMOND

Yale U. Astronomer Revises Estimate of Sun's Age

New estimates of the age of meteorites and planets that were formed during the birth of the sun have forced a revision in the sun's age, which is now estimated to be more than 200 million years younger than previously calculated.

From a more precise radioactive dating of the oldest meteorites, which are believed to have formed 4.53 billion years ago, David B. Guenther, an assistant professor of astronomy at Yale University, calculated that the sun should be 4.49 billion years old. This is more than 200 million years younger than the 4.7 billion years that has been used as a standard by astronomers for the past 20 years.

Mr. Guenther, who published his findings in the April 15 issue of the *Astrophysical Journal*, said his revision of the sun's age, which includes a margin of error of plus or minus 40 million years, took into account theories about the origin of the solar system and the evolution of the sun.

He said that because his new estimate was only a slight variation in the sun's age, it should not require astronomers to revise current stellar evolutionary models, including estimates that the sun has burned about half of its fuel and will begin to die when it is about 10 billion years old.

—KIM A. McDONALD

Superconducting Transistor Developed at U. of Houston

A team of researchers at the University of Houston's Texas Center for Superconductivity has developed a superconducting, microelectronic transistor that is more efficient and uses far less electricity than conventional transistors.

The new device—called a high-temperature superconducting magnetic-field effect transistor—represents one of the first applications of high-temperature superconductivity, a recently discovered property that enables certain types of ceramics, when cooled, to conduct electricity with no energy loss.

It was developed by Wei-Kan Chu, deputy director of the Texas center; Yuan-Jun Zhao, a graduate student at Houston; and Zu-Hua Zhang, a visiting scholar.

The three researchers, who have submitted a paper describing their achievement to *Applied Physics Letters*, say their device should be capable of out-performing transistors now used in microelectronics. It should also, they say, find its way into a variety of applications in communications and computing.

The new transistor, which can be constructed as small as one-millionth of a meter across, consists of a miniature electromagnet that produces very small magnetic fields when bursts of electricity less than one-trillionth of a second long are applied.

The researchers say that because such small amounts of electricity are needed to operate the device, the energy consumption of the transistor is significantly less than that of conventional transistors.

They add that recent tests on a prototype of the transistor—one that is about 500 times as large as that envisioned for commercial use—indicate that the superconducting transistor has "excellent switching and amplification properties" when it is cooled, using liquid nitrogen, to minus 196 degrees centigrade.

—K.A.M.

Breast-Feeding Practices Reflect Views on Women

The breast-feeding practices recommended by religious and medical authorities in colonial America reflect the society's views of women's proper sexual and maternal roles, says a historian at Allegheny College.

In the summer issue of the *Journal of Interdisciplinary History*, the historian, Paula A. Treckel, analyzed pamphlets, books, medical manuals, and other materials, written or circulated in the English colonies of North America in the 17th and 18th centuries, that pertained to reproductive practices. Although it is impossible to know how many people read such documents, she said, they undoubtedly reflected common attitudes of that era.

Ms. Treckel argued, for example, that breast-feeding practices probably contributed to a continuing female conflict between a woman's responsibility to her child and her relationship with her spouse.

Ms. Treckel noted that most manuals written in the 17th and 18th centuries conveyed the belief that sexual activity during the period when a woman was nursing her infant could jeopardize the health of the child. One author even warned that sexual thoughts could "infect the milk," and urged abstinence in thought and action.

To get around that dilemma, wealthy parents often placed a newborn with a wet nurse, who could breast-feed the child for the mother. Evidence suggests, Ms. Treckel said, that in England and in the colonies men were generally responsible for the decision to use a wet nurse, regardless of their wives' willingness to breast-feed.

Yet other documents suggest that women who engaged a wet nurse were censured for putting their own sexual gratification ahead of their children's welfare.

—E.K.C.

Cavazos Unveils Rules to Penalize High Default Rates

Continued from Page A1

month, marked the first time that colleges and trade schools were to be held responsible for the repayments of loans taken out by their former students. The department estimated that the rules would save the government $5.4-billion in default payments over the next 10 years. Student-loan defaults currently cost the department about $1.8-billion annually, and finding ways to reduce that amount has been a growing concern in Washington for more than a year.

The rules will allow the Department of Education, beginning January 1, 1991, to cut off federal loan money to persons attending institutions where more than 60 per cent of the former students have defaulted on their loans. Institutions with default rates of more than 20 per cent and less than 60.1 per cent will be given time to reduce their default rates and be required to take several actions set down by the department. If they don't take such steps, they will risk losing loan money.

If the department determines that an institution has done everything it can to reduce its default rate but the rate still remains high, the institution will not lose aid.

Most Are Trade Schools

The vast majority of the 3,415 institutions with default rates of more than 20 per cent are community colleges and for-profit trade schools. Many of the nation's approximately 100 historically black colleges also have rates that exceed that amount.

Under rules proposed last year by Mr. Bennett, the department would have cut off all federal student aid—not just loan money—to institutions with default rates of 20 per cent or more. Unlike the regulations released last week, Mr. Bennett's rules would not have allowed an institution to continue receiving aid if its default rate remained high.

In announcing the rules, Secretary Cavazos said they were "demanding," but "encourage a positive approach that emphasizes improvement of loan programs."

"As a former university president, I personally know the federal aid programs, the good they do, and the opportunities they offer those least able to pay their own way," he said. "But I also know there are some unscrupulous and uncaring institutions out there who are taking advantage of a program designed to help our students, not financially shackle them."

The Education Department also released a list of the default rate of each college, university, and trade school in the country—7,843 institutions in all. According to the list, 188 institutions have default rates of more than 60 per cent. Most of those are for-profit trade schools.

About 450 institutions have default rates of more than 40 per cent but less than 60.1 per cent, the department said. Beginning January 1, 1991, those institutions must reduce their default rates by 5 percentage points a year—until their rates reach 39 per cent—or risk losing aid. Most of the institutions are trade schools or community colleges. About 30 historically black colleges and universities have rates in this range.

All institutions with default rates of more than 20 per cent but less than 60.1 per cent will be required to adopt "default-management plans" and to take several steps to reduce the likelihood that their students will default. About 3,227 institutions fall into this category.

Job-Placement Programs

The department is expected to work with each of the 3,227 to develop the plans. Department officials did not offer many details on what the plans will include, but said that institutions might be required to expand job-placement programs and to remind borrowers when they must begin repaying loans.

In the past, colleges and trade schools have complained about attempts by the Education Department to penalize them for loan defaults by their former students. They have said that banks are responsible for collecting loans, and that colleges should not be held responsible.

Institutions that educate large numbers of low-income and minority students—community colleges, for-profit trade schools, and black colleges—have said the rules would hurt them the most because studies have found those students are more likely than others to default. The institutions have said that if they are to continue serving such students, their default rates will remain high.

Secretary Cavazos said last week that the department would take the student body into account when it decided whether to eliminate loan money to an institution.

"It's not an absolute cut-off," said Mr. Cavazos.

Department officials did say, however, that if an institution enrolled large numbers of low-income or minority students, that in itself would

Colleges Say U.S. Calculation Method Distorts the Loan-Default Problem

WASHINGTON

Although college officials generally praised the new student-loan-default regulations released by the Education Department last week, many objected to the way the department calculated default rates.

The department released a list of the nation's 7,843 colleges and for-profit trade schools, along with their default rates for 1986. (*The Chronicle* will publish portions of the list in a forthcoming issue.) Analysts of student-aid programs and representatives of colleges said the formula that the department used had generally made the default problems look much worse than if other, more common formulas had been used.

The department looked at how many borrowers who left an institution in 1986 had not started to repay by the end of 1987. The default rate was figured by dividing that number by the total number of students who were supposed to start repaying during that time. For example, according to the department's calculations, if 1,000 students with loan debts graduated from an institution in 1986, and if 300 had failed to begin repaying by the end of 1987, the institution's default rate would be 30 per cent.

Charles E. M. Kolb, Deputy Under Secretary of Education, defended the department's calculations, saying, "We are very confident about the data."

But the department typically has used more long-term calculations for figuring the default rate nationwide, looking at how many students have owed student-loan money since the program began in 1965, versus how many have defaulted on their loans.

The Disadvantaged a Factor

If the department had used that formula in its new regulations, student-aid analysts say, most colleges and schools would have had lower rates, because the calculation takes into consideration people who may default but actually begin repaying a few years later.

College officials also said the formula used by the department would be particularly harsh on institutions that enroll disadvantaged students. "The mechanism for calculating loan defaults will operate to the detriment of any school that has people coming out into low-income jobs when they first start out," said William A. Blakey, a Washington lawyer for the United Negro College Fund and a representative of for-profit trade schools. That, he said, is because those students may default on their loans soon after graduation, but they could begin repaying after they get better jobs a few years later.

Mr. Blakey said the problem was especially acute at historically black colleges and trade schools, whose students are less likely to get higher-paying jobs than people who graduate from other institutions.

Highest Rates at Trade Schools

Indeed, the nation's for-profit trade schools have the highest default rates. According to the department's list, for example, Sawyer School of Business in Michigan has a default rate of 93.8 per cent and Debbie's Alabama Beauty College has a default rate of 77.4 per cent. Some trade schools have low default rates, however, such as Katharine Gibbs School in Boston, with a 2.6 per cent default rate.

Many of the nation's approximately 100 historically black colleges also have high default rates, according to the department's calculation.

For example, Saint Augustine's College has a rate of 55.1 per cent, and Paine College's is 50.3 per cent. Some historically black institutions, however, have lower rates, including Hampton University, at 14 per cent.

College officials also said the formula the department uses in its rules fails to consider that, although an institution's default rate may be high, the amount of money its students owe may be low. Likewise, an institution's default rate may be low, but the amount of money its students have failed to repay may be high.

For example, if 10,000 student borrowers at one institution graduated in 1986 and 1,000 defaulted by the end of 1987, the institution's default rate would be 10 per cent. If 100 students borrowed at a second institution and 50 defaulted, the second institution's default rate would be 50 per cent. Under the department's rules, the second institution would be penalized, but the first would not, even though fewer actual loans—and therefore dollars—would be in default at the second institution than at the first.

—ROBIN WILSON

FACT FILE: Defense Department Contracts to Non-Profit Organizations, Fiscal 1988

Massachusetts Institute of Technology	$403,665,000	Auburn University	$4,318,000
Aerospace Corporation	367,000,000	Vanderbilt University	4,176,000
Johns Hopkins University	353,949,000	University of Florida	4,059,000
Mitre Corporation	351,616,000	University Corp. for Atmospheric Research	3,859,000
Charles S. Draper Laboratory	139,592,000	Ohio State University	3,786,000
University of California	66,325,000	Southeastern Center for Electrical Engineering Education	3,770,000
SRI International	59,125,000	New York University	3,676,000
IIT Research Institute	55,557,000	University of Colorado	3,508,000
Carnegie Mellon University	50,014,000	University of North Carolina	3,379,000
Pennsylvania State University	46,816,000	Polytechnic University of New York	3,197,000
University of Texas	46,008,000	University of Rhode Island	3,145,000
Rand Corporation	44,928,000	University of Virginia	3,129,000
Georgia Institute of Technology	41,395,000	Case Western Reserve University	3,035,000
Stanford University	33,773,000	Northwestern University	3,007,000
University of Southern California	27,819,000	Clemson University	3,001,000
Analytic Services Inc.	27,362,000	Duke University	2,951,000
Battelle Memorial Institute	24,450,000	University of Tennessee	2,760,000
Riverside Research Institute	24,434,000	University of Iowa	2,649,000
Hudson Institute	23,655,000	University of Connecticut	2,498,000
University of Washington	20,837,000	Arizona State University	2,447,000
University of Illinois	20,697,000	Syracuse Research Corporation	2,337,000
Institute for Defense Analyses	20,657,000	University of Pittsburgh	2,323,000
University of Dayton	19,423,000	Rutgers University	2,265,000
Utah State University	17,532,000	University of Chicago	2,239,000
South Carolina Research Authority	16,161,000	Dartmouth College	2,226,000
Cornell University	14,004,000	Native American Service Association	2,205,000
Woods Hole Oceanographic Institution	13,423,000	Michigan Department of Public Health	2,196,000
University of Maryland	13,292,000	University of Delaware	2,140,000
Logistics Management Institute	12,297,000	Northeastern University	2,122,000
University of Massachusetts	10,389,000	General Hospital Corporation (Mass.)	2,112,000
Columbia University	9,958,000	University of Hawaii	2,044,000
Southwest Research Institute	9,604,000	Catholic University of America	1,881,000
University of Michigan	9,241,000	Southern Methodist University	1,861,000
California Institute of Technology	9,204,000	American Society for Engineering Education	1,842,000
Purdue University	8,877,000	Louisiana State University	1,837,000
George Washington University	8,344,000	Rice University	1,820,000
ITT Research Institute	8,212,000	University of Cincinnati	1,566,000
Research Triangle Institute	7,693,000	National Center for Metalworking Technology	1,500,000
New Mexico State University	7,692,000	Texas Tech University	1,495,000
Oregon State University	7,637,000	Lehigh University	1,456,000
Syracuse University	7,513,000	University of Miami	1,450,000
University of Wisconsin	7,480,000	Drexel University	1,438,000
Southern Research Institute	6,957,000	Michigan State University	1,372,000
Yale University	6,858,000	Mayo Foundation	1,334,000
Rensselaer Polytechnic Institute	6,690,000	Fashion Institute of Technology	1,330,000
Environmental Research Institute of Michigan	6,601,000	Emmanuel College	1,317,000
Brown University	6,470,000	Wright State University	1,269,000
University of Rochester	6,405,000	New Mexico Institute of Mining and Technology	1,236,000
University of Pennsylvania	6,402,000	University of Lowell	1,212,000
Salk Institute for Biological Studies	6,254,000	Palisades Institute for Research Services	1,206,000
Texas A&M University	6,075,000	Temple University	1,192,000
Princeton University	5,948,000	Washington State University	1,170,000
University of New Mexico	5,923,000	American Red Cross	1,162,000
Harvard University	5,919,000	Michigan Technological University	1,139,000
University of Alabama	5,858,000	Boston College	1,128,000
University of Utah	5,852,000	Wentworth Institute of Technology	1,104,000
North Carolina State University	5,851,000	La Jolla Institute	1,096,000
University of Arizona	5,697,000	Southern Illinois University	1,052,000
Boston University	5,541,800	City University of New York	1,038,000
State University of New York	5,524,000	Wayne State University	1,036,000
National Academy of Sciences	5,279,000	Scripps Clinic Research Foundation	1,022,000
University of Central Florida	4,999,000	University of Wyoming	1,014,000
Virginia Polytechnic Institute and State University	4,842,000	Miami Valley Research Institute	1,004,000
Mercer University	4,500,000	University of Oklahoma	1,001,000
Colorado State University	4,444,000		
University of Minnesota	4,325,000		

Note: Includes Department of Defense contracts of greater than $1-million to colleges, universities, and other non-profit organizations. The contracts were for research, development, testing, and evaluation for military projects and for civilian water-resource projects. Other types of funding are not included in this table.

SOURCE: U.S. DEPARTMENT OF DEFENSE

California Higher Education Gets Some Old Advice From a New Source

By CATHERINE BÉDARIDA

PARIS

A group of distinguished educators told leaders of California colleges and universities last week that the Golden State must find more money for higher education and attract more minority students and faculty members.

While the message was hardly new to the state's college officials, it was highly unusual, nonetheless. The advice was in a report prepared by a panel of international scholars appointed by the Organization for Economic Cooperation and Development, a 24-nation group of Western industrialized countries that meets to discuss economic and social policy. The O.E.C.D. periodically conducts studies of the higher-education systems of various countries, and this year, for the first time, examined part of a country.

> "California is a test case of the capacity of an educational plan to unite a prosperous country."

In the state's size and diverse population, said the O.E.C.D. officials in their report, California is more typical of a country than a state. "California may be the crucial, and is certainly a fascinating, test case of the capacity of an educational plan to unite a prosperous country," said the report.

'Legitimate Questions'

It was prepared by A. H. Halsey, a sociologist at Oxford University; Michio Nagai, a senior administrator at the United Nations University in Tokyo; and Pierre Tabatoni, former chancellor of the University of Paris.

The heads of California's three public higher-education systems, as well as top officials from the state's public-school system and its private colleges, traveled here to discuss the report with the O.E.C.D. panel.

The California officials said the report provided new insights into their own system. "It raises very legitimate questions," said David Mertes, chancellor of the California Community Colleges.

Contrasting Experiences

At the same time, they said the outlooks and experiences of California college officials and those of the international scholars were quite different.

David P. Gardner, president of the University of California system, said the study made him realize "how difficult it is to convey the subtleties of our higher-education system to people coming from other countries, whose population, history, and practices are so fundamentally different from our own."

W. Ann Reynolds, chancellor of the California State University System, said: "Other Western countries believe that education systems should be driven by manpower needs. Ours is driven by what parents and students aspire to."

At the same time, however, she said the report as a whole was "very accurate."

The study said the panel was "hugely impressed" by the way California educates so many people. But it said that high dropout rates of black and Hispanic students marred that success. The report suggested that California officials could improve their state's system by devoting more money to elementary and secondary education and by hiring more minority teachers for the public schools.

The O.E.C.D. officials said they thought it would benefit the California colleges to have the outside analysis.

Dorotea Furth, director of higher-education surveys for the O.E.C.D., said: "Californians usually seem very happy; they don't think they can learn anything. But when some of these questions are posed from outside, it is very useful to them."

FACT FILE: 1988 Federal Funds for Student Aid and Research, Selected Programs

	Student aid, in thousands		Research grants, in thousands			
	Pell Grants	Veterans' ed. benefits	Health and Human Services	National Science Foundation	NASA	Endowment for the Humanities
Alabama	$51,740	$23,321	$91,518	$6,434	$7,540	$1,918
Alaska	2,693	2,415	636	7,996	405	638
Arizona	61,381	16,856	37,963	20,421	9,913	1,279
Arkansas	34,498	8,700	6,756	1,307	156	1,256
California	243,731	90,292	815,695	237,722	57,663	10,244
Colorado	54,379	20,271	78,249	113,020	9,935	1,508
Connecticut	27,910	4,613	138,395	18,085	974	2,367
Delaware	26,578	1,401	2,493	6,482	688	933
District of Columbia	19,835	989	63,693	25,294	4,683	5,390
Florida	167,042	42,926	83,074	25,472	4,924	1,241
Georgia	66,558	24,121	66,933	16,073	3,620	1,740
Hawaii	6,071	5,644	9,094	11,861	3,438	893
Idaho	19,375	4,532	1,059	967	600	655
Illinois	173,249	22,512	184,020	88,287	8,497	7,812
Indiana	86,243	13,341	55,255	38,645	2,907	1,877
Iowa	64,501	7,790	60,220	8,718	2,797	971
Kansas	50,266	9,833	18,779	5,445	1,448	635
Kentucky	70,319	11,080	16,546	3,895	435	1,444
Louisiana	115,983	14,809	40,577	5,607	1,424	1,159
Maine	12,098	3,829	11,221	4,221	450	799
Maryland	44,701	10,658	356,514	36,648	13,593	5,200
Massachusetts	59,738	9,857	570,866	143,675	20,168	9,613
Michigan	143,382	19,667	149,397	48,890	6,798	1,659
Minnesota	91,425	14,111	122,585	21,482	1,724	1,487
Mississippi	62,093	7,766	7,490	2,376	1,720	878
Missouri	93,112	16,634	130,508	13,453	2,609	1,193
Montana	19,020	3,454	2,836	2,449	307	677
Nebraska	34,588	7,776	14,852	3,690	503	526
Nevada	11,877	3,916	3,151	2,541	18	393
New Hampshire	5,851	2,863	20,151	5,296	2,597	1,589
New Jersey	64,168	7,720	55,578	40,659	2,865	2,401
New Mexico	26,327	8,488	19,701	6,960	1,862	1,261
New York	393,228	21,268	688,255	182,887	14,232	21,457
North Carolina	67,295	25,864	211,638	31,504	3,649	1,931
North Dakota	20,822	3,741	1,862	1,483	90	493
Ohio	188,488	26,597	148,104	25,572	16,747	1,314
Oklahoma	68,125	16,766	15,419	6,004	712	1,574
Oregon	45,111	10,941	48,923	18,550	1,249	1,210
Pennsylvania	185,254	19,292	365,024	76,210	9,217	6,089
Rhode Island	11,237	2,521	25	15,277	1,965	1,946
South Carolina	47,309	17,294	18,203	6,248	492	872
South Dakota	23,703	3,295	1,106	869	389	429
Tennessee	70,015	15,271	41,931	4,848	1,952	583
Texas	258,262	66,281	266,013	47,384	20,344	2,826
Utah	45,124	6,491	42,860	12,666	1,458	926
Vermont	6,562	860	20,556	2,737	112	926
Virginia	57,948	28,119	88,197	19,898	12,067	4,037
Washington	69,141	29,337	182,275	33,299	4,527	1,859
West Virginia	27,695	3,885	9,548	1,413	211	534
Wisconsin	80,261	12,200	96,807	29,963	5,143	1,688
Wyoming	9,494	2,192	905	3,696	207	631
American Samoa	94	152	—	—	—	—
Guam	1,200	388	99	88	—	—
Northern Marianas	128	1	—	—	—	—
Puerto Rico	214,210	4,342	10,053	10,409	95	547
Virgin Islands	349	30	408	—	—	223
Total	**$3,901,788**	**$759,254**	**$5,528,950**	**$1,505,080**	**$272,119**	**$123,701**

Note: Figures for research include only grants, not contracts. Some of the research grants are awarded to institutions besides colleges and universities.

SOURCE: BUREAU OF THE CENSUS, U.S. DEPARTMENT OF COMMERCE

STATE NOTES

Texas Board Member Quits Over Bill to Expand Colleges

Ignoring veto threats and warnings about creating too many colleges, Texas lawmakers have approved bills converting several two-year universities into four-year institutions.

In one case, a bill prompted the resignation last week of a member of the state's Higher Education Coordinating Board. The member, Sam Carroll, said he was upset that the Legislature had approved the expansion of Central Texas College without consulting the board. The board has traditionally reviewed any expansion proposals before they are carried out.

Three of the proposed expansions are likely to end up on the cutting board of Gov. William P. Clements, Jr. The Governor, a Republican, promised to veto legislation expanding the University of Texas at Dallas, which now offers instruction only to college juniors and seniors, into a four-year institution unless lawmakers took out provisions expanding two other institutions.

Despite that threat, lawmakers included provisions expanding the University of Texas at Permian Basin and Pan American University at Brownsville.

The expansions of the Dallas, Permian Basin, and Pan American campuses all are contingent on the approval of the coordinating board.

—KATHERINE S. MANGAN

Texas Lawmakers Block Bill Requiring AIDS Programs

A bill that would have required all Texas state colleges and universities to develop and distribute AIDS policies to students and employees died in the waning days of the legislative session.

Opponents argued that public colleges and universities were already taking steps to curb the spread of AIDS and that they did not need further regulation from the state. The opponents also said that any information sent to students should stress the illegality of homosexual acts under Texas law.

The defeat provoked an angry response from Rep. Debra Danburg, one of the bill's sponsors. She called her opponents "right-wing Nazis," adding, "How many of our students have to die before some elected officials are able to overcome their homophobic attitudes on AIDS?"

She cited a recent study by the American College Health Association, which she said had found that four in every 1,000 students at the University of Texas at Austin might be infected with the AIDS virus. That is about double the national average for college students. —K.S.M.

Pressured by Regents, Maryland Chancellor Quits

One year after the reorganization of Maryland higher education that put a strengthened and expanded University of Maryland system under his control, Chancellor John S. Toll announced last week he was resigning.

The resignation, rumored for the last year, came amid a new spate of news reports suggesting that the Board of Regents, and particularly its chairman, Peter F. O'Malley, had been seeking his ouster.

Mr. Toll had been chancellor since 1978 and helped to shepherd through the reorganization last year that merged several state colleges and universities into an 11-campus University of Maryland system. "This is a good time to seek a replacement for someone who will lead the university system through the next decade," said Mr. Toll, adding that at age 65, it was "reasonable" to retire from an executive position.

Regarded as an able administrator, Mr. Toll has an aggressive style that reportedly displeased several of the new members of the Board of Regents as well as campus presidents. Mr. O'Malley said that for two months a committee of the Board of Regents had been privately discussing the need to replace Mr. Toll with a chancellor whose management skills better suited the more complex university.

Mr. Toll, who last month proposed a new economic and social role for the University of Maryland, said he did not expect his resignation to affect the proposal.

The plan calls for the university to become more involved in promoting economic development and addressing social and economic problems in Baltimore.

Some regents and college presidents had expressed reservations about whether it would have the university paying more attention to social goals than to the basics of a college education.

—GOLDIE BLUMENSTYK

N.Y. Board Toughens Rules for Prospective Teachers

After many years of debate, the New York State Board of Regents last month adopted tough new requirements for prospective elementary- and secondary-school teachers.

Under the new regulations, prospective teachers will have to pass a general-knowledge exam, serve a one-year internship, take at least one year of a foreign language, and focus their college educations on liberal arts before they can be certified.

The general-knowledge exam will test candidates in history, math, science, and social studies, and will be taken in addition to a general test on teaching methods and a test in the teacher's specialty area.

The new regulations are designed to produce teachers who have both "breadth and depth" of preparation, said Donald Nolan, the state's deputy education commissioner. The new regulations will not go into effect until 1993 so colleges will have time to revamp their programs, he added.

—CHRISTOPHER MYERS